

Taxonomic Studies in *Desmodium heterocarpon* (L.) DC. (Leguminosae)

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Desmodium heterocarpon (L.) DC. の分類学的問題

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Seven items of taxonomic and nomenclatural problems in *Desmodium heterocarpon* (L.) DC. are studied and the following conclusions are obtained. 1) *D. toppinii* is identical with *D. heterocarpon* var. *heterocarpon*. 2) *D. heterocarpon* subsp. *angustifolium* is a new subspecific name for *D. reticulatum*. 3) *D. polycarpum* var. *rigidum* is a synonym of *D. heterocarpon* subsp. *angustifolium*. 4) *D. heterocarpon* subsp. *angustifolium* f. *pilosum* is a distinct form. 5) *D. heterocarpon* var. *heterocarpon* f. *albiflorum* is a white flowered form. 6) *D. heterocarpon* subsp. *ovalifolium* is newly recognized at the subspecific rank. 7) A key to all the infraspecific taxa of *D. heterocarpon* is prepared.

Desmodium heterocarpon (L.) DC. is distributed in tropical, subtropical and warm regions in Southeast & East Asia, India, Pacific islands and Australia. This species has been known as *D. heterocarpum* since De Candolle (1825), but the correct specific epithet is *heterocarpon* based on *Hedysarum heterocarpon* L. (Van Meeuwen 1961). The species is common on sunny roadsides or in grasslands and along or in thickets or forests. It belongs to the section Nicolsonia of the subgenus Sagotia and one of the most highly polymorphic species in the genus in Asia (Ohashi 1973, 1990).

Desmodium heterocarpon has been variously delimited by many taxonomists. *Hedysarum heterocarpon* L., published in Sp. Pl. 747 (1753) with such an important character of the species as 'floribus spicatis' for the section Nicolsonia, was

described on the basis of specimens from Ceylon collected by Hermann in Burmann in Thesaurus Zeylanicus 117, t. 53, f. 1 (1737). It was transferred by De Candolle (1825) to *Desmodium* as *D. heterocarpum* (L.) DC., and he circumscribed this species with elliptic, obtuse and glabrous leaflets and erect pods. The second species that is recognized later to be similar to *D. heterocarpon* was described by Burman f. (1768) as *Hedysarum siliquosum*, and the third was by Poiret (1805) as *Hedysarum polycarpum*. These two were transferred by De Candolle (1825) to *Desmodium*, i.e., *D. siliquosum* (Burm.f.) DC. and *D. polycarpum* (Poir.) DC., respectively. The fourth species similar to *D. heterocarpon* was *D. trichocaulum* DC. collected by Wallich in Nepal. This species was put by De Candolle (1825) in a position rather remote

from *D. heterocarpum*, but Baker (1876) recognized it as *D. polycarpum* var. *trichocaulon* (DC.) Baker, though this variety, according to Baker's description, seems to be very close to *D. heterocarpum* var. *strigosum* Van Meeuwen. Succeedingly many species similar to *D. heterocarpum* have been described from Southeast Asia.

Schindler (1928) recognized six species to be distinct in his monographic bibliography of the

genera *Desmodium* and its allies. These are regarded later by Van Meeuwen (1961) and by Ohashi (1973) to be identical with *D. heterocarpum* or to be members of *D. heterocarpum* group. They are *D. heterocarpum*, *D. siliquosum*, *D. ovalifolium*, *D. reticulatum*, *D. birmanicum*, and *D. toppinii*. Schindler's delimitation of *D. heterocarpum* is, therefore, very narrow. However, in local floras in Asia *D. buergeri* or *D. polycarpum*, which were

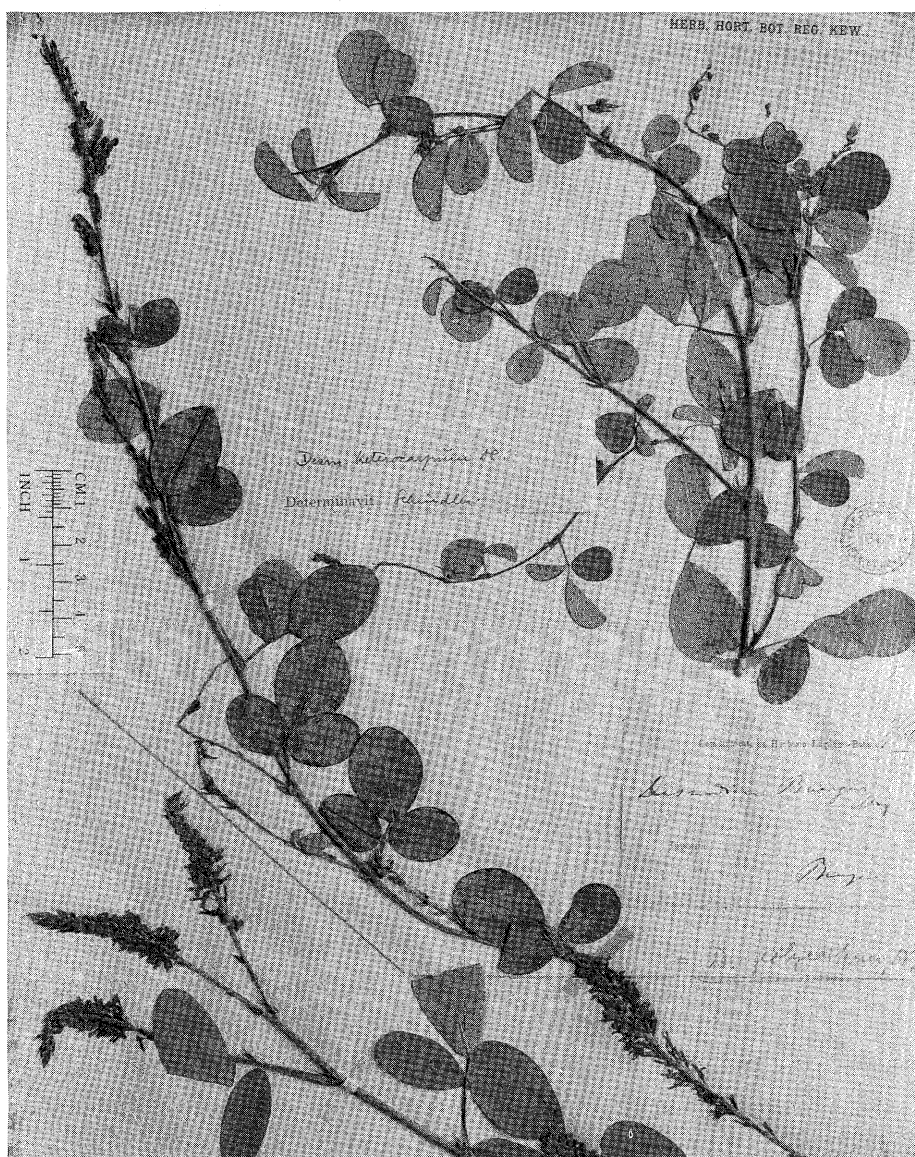


Fig. 1. An isosyntype of *Desmodium buergeri* in K.

included as synonyms of *D. heterocarpum* by Schindler (1928), had been treated as distinct from *D. heterocarpum*. *Desmodium buergeri* (Fig. 1), which was described on the basis of specimens collected in Japan, has often been recognized to be distinct in Japan.

Van Meeuwen (1961), however, expanded the species boundary of *D. heterocarpum* by the inclusion of *D. siliquosum* and *D. ovalifolium*. Ohashi (1973) accepted her concept and expanded it incorporating in *D. heterocarpum* two more species, i.e., *D. birmanicum* and *D. reticulatum*. This concept (Ohashi 1973) becomes the broadest for *D. heterocarpum*, but fundamental characters circumscribing the species are almost the same as those of De Candolle (1825) and Ohashi (1973). *Desmodium heterocarpum* is characterized by Ohashi (1973) as having 1–3-foliolate glabrous leaves, principally elliptic or ovate or obovate terminal leaflets, usually retuse or obtuse at the apex, longer inflorescences (usually 3–13 cm long) and erect or ascending pods with 4–8 articles of transverse-oblong or -obovate (shorter than 4.5 mm long and less than twice as long as broad) within the section *Nicolsonia* that includes 12 species in Asia (Ohashi 1973). Such diversity of opinions on the species concepts of *D. heterocarpum* is caused by the reason that whole ranges of the variation of this species have hardly been recognized.

Desmodium heterocarpum includes several forms in Southeast Asia that are considered to be differentiated from the typical form by a few morphological characters. They occur in narrow areas or in wide ranges. For example, a form with glabrous pods is known only from Ceylon and South India, and that with long fruit-pedicels (7–10 mm long) and lax-flowered inflorescences from Burma and Thailand. A characteristic form having narrow leaflets and long inflorescences

occurs in Burma, Thailand, Cambodia, Laos, Vietnam, and China. On the other hand, a form with inflorescence-rachides densely covered with appressed straight hairs widely occurs within the ranges of the typical form of which inflorescence-rachides are covered with spreading hooked hairs, though both forms have somewhat different ranges in distribution and are usually not growing side by side. Biosystematic investigations of *D. heterocarpum* such as that done by Schultze-Kraft and Benavides (1988) are necessary to understand polymorphic natures of this species in local populations of various localities in the Asiatic regions.

In the present paper seven items of taxonomic and nomenclatural problems in *D. heterocarpum* are treated mainly after examination of herbarium specimens in A & GH, BM, E, K, L, P, TAI, TI, and TUS. Also, I have observed variation in living material in Nepal in 1977, Taiwan in 1982, '84 and '88 and in Yunnan, China, in 1984.

I would like to thank those herbaria for the use of their facilities and for making material available for study. I would also like to thank Dr. R. Schultze-Kraft of Centro Internacional de Agricultura Tropical (CIAT), Colombia, for information relating to variation of living material of *D. heterocarpum* in Southeastern Asia and supplying many specimens of his *Desmodium* collection to our herbarium (TUS). Also, I am deeply indebted to Dr. J. F. Veldkamp of the Rijksherbarium, Leiden, for reading the manuscript of this paper and making valuable suggestions for its improvement.

1) *Desmodium toppinii* and *D. heterocarpum*
Desmodium toppinii Schindler and *D. heterocarpum* (L.) DC. are distinguished by the size of their pods and terminal leaflets, and by the relative size between terminal and lateral leaflets (Ohashi 1973). Among specimens from Indo-China kept in P (photo in TUS) there are forms intermediate

between these two species, for example *Poilane 14485* from Vietnam and *Poilane 28495* from Laos. Moreover, variation ranges in these characters show wider ranges than previously observed in *D. heterocarpon*, and the differences between both are continuous. The former species, therefore, becomes a synonym of the latter.

***Desmodium heterocarpon* (L.) DC., Prodr. 2: 337 (1825), ut *heterocarpum*; Ohashi in Ginkgoana 1: 210 (1973).**

Hedysarum heterocarpon L., Sp. Pl. 747 (1753). Type: Ceylon. *Herb. Hermann* 2: 32, 3: 39 & 4: 20 (BM, syntypes: designated by Schubert in Fl. Trop. E. Afr. Leg. Pap. 462, 1971).

subsp. ***heterocarpon* var. *heterocarpon***: Ohashi, l. c. 213 (1973).

D. toppinii Schindler in Fedde, Rep. 21: 5 (1925); Ohashi, l. c. 226, pl. 33a, figs. 67-3 (pod) & 64-11 (seed) (1973), syn. nov. Type: Burma, Wasi, alt. 7000ft. *S.M. Toppin 4048* (CAL, holo.; E, iso.).

Description of leaves and pods of *D. heterocarpon* (emending that of Ohashi, l. c.): Leaves 3-, 1- & 3- or 1-foliate; leaflets 1.5–12 cm long, 1–5 cm wide, lateral leaflets smaller than or nearly equal to the terminal ones, 0.8–10 cm long, 0.5–4 cm wide. Pods sessile, indehiscent and separating at the joint of articles or sometimes dehiscent along the lower suture, narrowly oblong, 1.5–2.8 cm long, 2.5–4.5 mm wide, with 4–8 articles; articles quadrate or broadly oblong, 2.5–4.5 mm long, 2–4.5 mm wide.

2) **Correction of nomenclature of *Desmodium heterocarpon* subsp. *angustifolium* Ohashi and the type of *D. reticulatum*** A new combination *Desmodium heterocarpon* subsp. *angustifolium* (Craib) Ohashi was made on the basis of *D. polycarpum* DC. var. *angustifolium* Craib. However, the variety has no description. It was published by Craib in Kew Bulletin 1911: 38 as

follows:

“*Desmodium polycarpum* DC. var. *angustifolia* Benth. MSS.

Chiengmai, in eng jungle on Doi Sootep, 600 m. *Kerr 772*. Dist. Tavoy (Wall. Cat. 5729K in Herb. Kew).”

The specimen *Kerr 772* (Fig. 2) is in Kew and is definitely referable to the subsp. *angustifolium*. This was republished in his paper in the Aberdeen University Studies 57: 59 (1912), but without any changes from the original publication. Hence, the name is a “nomen nudum” and cannot serve as a basionym of *Desmodium heterocarpon* subsp. *angustifolium* (Craib) Ohashi. The combination at the subspecific rank using Craib’s varietal epithet, however, is valid. Since no valid names were available at the rank of subspecies, the Craib’s epithet, *angustifolium*, was chosen as a new name on the basis of the Article 72 of the International Code of Botanical Nomenclature, 1988.

The earliest valid name for this plant at the rank of species is *D. reticulatum* Champ. ex Benth. In the original publication of this species, Benth. (1852) noted as “A single specimen gathered in Hong-Kong, without any note of the precise locality.” There are, however, two sheets of the same collection in Kew; one is from the Benth. Herbarium and the other from the Hooker Herbarium. The sheet of the Benth. Herbarium is naturally considered to be the holotype of this combination (Fig. 3).

***Desmodium heterocarpon* (L.) DC.**

subsp. ***angustifolium*** Ohashi in Ginkgoana 1: 212 (1973), nom. nov.

D. reticulatum Champ. ex Benth. in Hook., Kew Journ. 4: 46 (1852). Benth., Fl. Hongk. 84 (1861). Gagnep., Fl. Gén. Indoch. 2: 585 (1920). Craib, Fl. Siam. Enum. 1: 415 (1928). Merr. & Chun in Sunyatsenia 2: 248 (1935). Chun & Chang, Fl. Hainan. 2: 275 (1965). Type: Hong Kong.

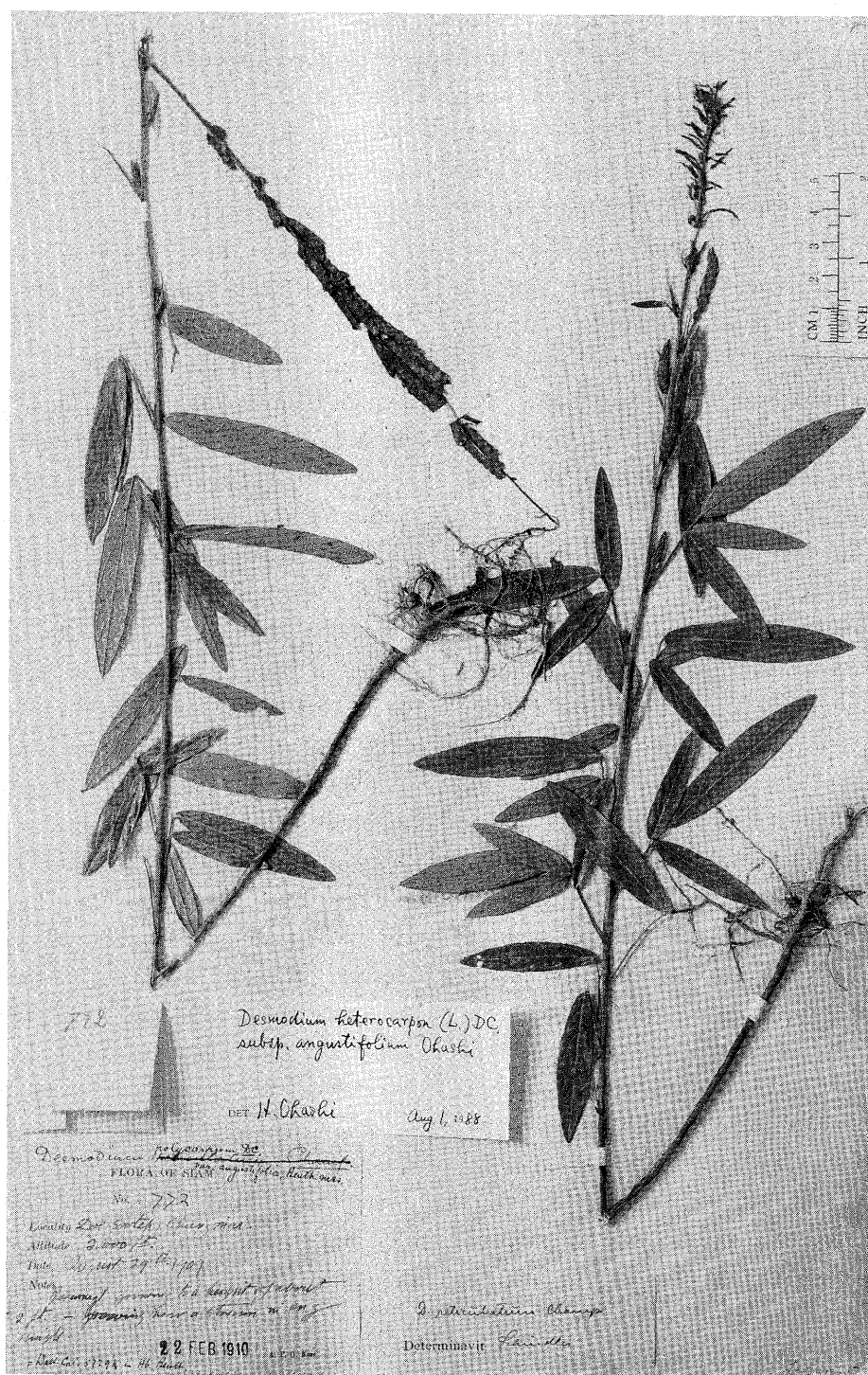


Fig. 2. The specimen, Kerr 772 (K), that was cited by Craib under *Desmodium polycarpum* DC. var. *angustifolia* Benth.

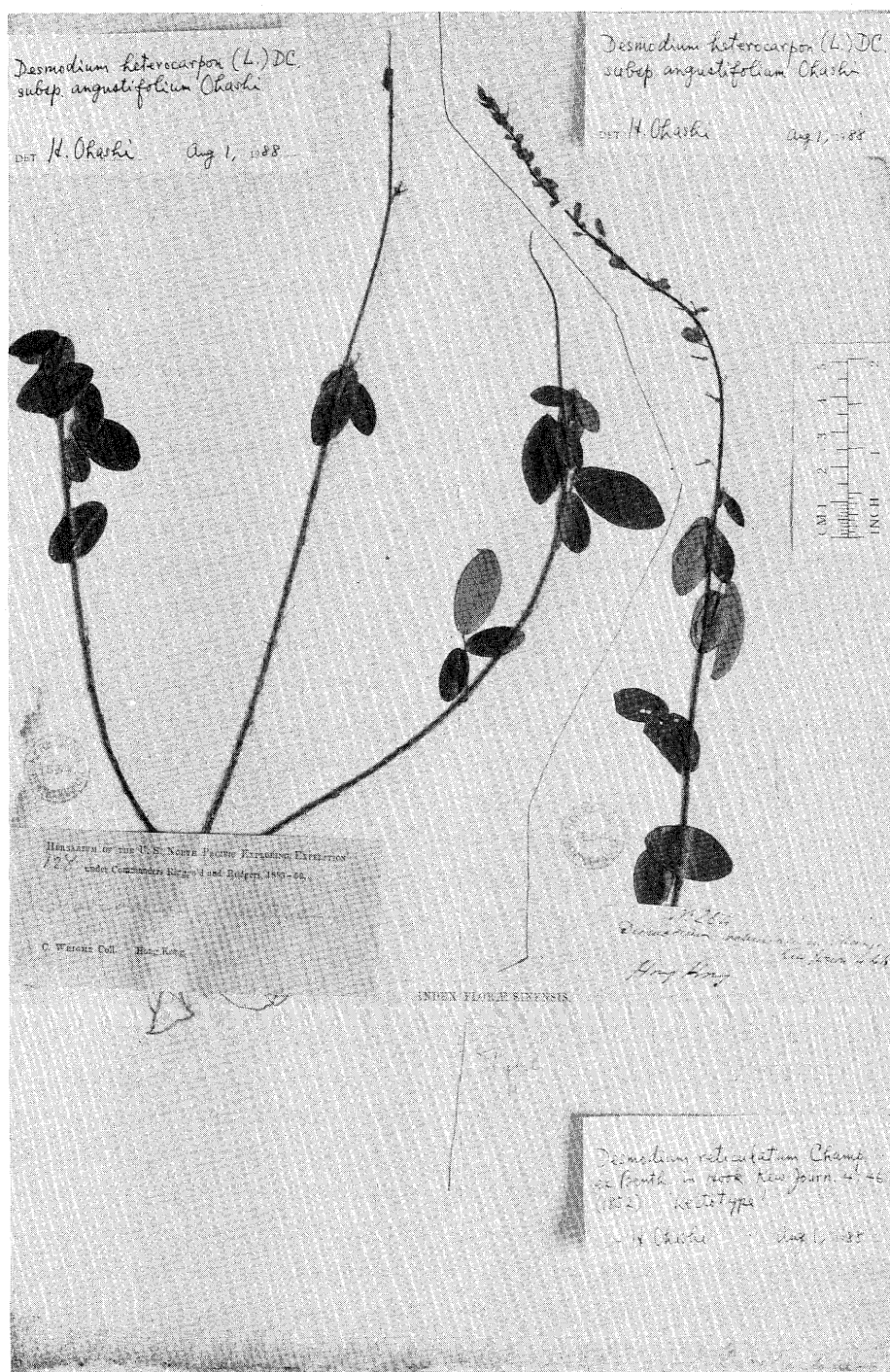


Fig. 3. The holotype of *Desmodium reticulatum* Champ. ex Benth. (Champion 254, the right, K). There are two specimens on one sheet; the right holotype and the left Weight 128.

Champion 254 (K holo. [Herb. Benth.], iso. [Herb. Hook.]).

Meibomia reticulata (Champ. ex Benth.) O. Kuntze, Rev. Gen. **1**: 198 (1891).

Desmodium polycarpum DC. var. *angustifolium* Craib in Kew Bull. **1911**: 38 (1911), nom. nud.

D. polycarpum var. *rigidum* Ridley in Journ. Str. Br. Roy. As. Soc. **59**: 97 (1911), syn. nov.

Desmodium heterocarpon subsp. *angustifolium* Ohashi is characterized as follows: The stems pubescent or sometimes pubescent mixed with minute hooked hairs (less than 0.5 mm long) especially on the upper parts. Leaves 3-foliolate or sometimes 1-foliolate in the lower parts of the stem; terminal leaflets narrowly ovate, lanceolate or narrowly oblong, acute or obtuse at apex, 2.5–8.5 cm long, 0.8–3 cm wide, 3–6.5 times as long as wide, glabrous or sometimes with minute hooked hairs (less than 0.1 mm long) and/or with straight hairs (about 0.5 mm long). Inflorescences 10–30 cm long, scarcely branched. Calyxes 1.2–1.6 mm long, 4-lobed, the lowest lobes longest. Pods erect or sometimes ascending, neither deflexed nor spreading. Seeds obliquely rectangular, about 1.8 × 1.5 mm, reddish brown.

Distribution: Burma, Thailand, Peninsular Malaysia, Indo-China, and China.

Habitat: In forests, along roadsides, and in open places.

3) **Identity of *Desmodium polycarpum* var. *rigidum* Ridley** *Desmodium polycarpum* var. *rigidum* Ridley, that has been neglected in the recent treatments of the genus or in floras, is identical with *D. heterocarpon* subsp. *angustifolium* Ohashi as listed in the synonyms of the subspecies mentioned above. Three specimens were cited under this variety in the original description. They are *Ridley 15147*, *Curtis s.n.* from Lankawi, and *Curtis 459* from Penang, Ayer

Hitam. Of these specimens the first one is chosen as the lectotype of the variety.

Desmodium heterocarpon subsp. *angustifolium* Ohashi.

D. polycarpum var. *rigidum* Ridley in Journ. Str. Br. Roy. As. Soc. **59**: 97 (1911); Fl. Malay Pen. **1**: 609 (1922). Lectotype: Peninsular Malaysia: Kedah, Alor Sta. *Ridley 15147* (K).

4) **The taxonomic position of *Desmodium reticulatum* var. *pilosum* Craib** *Desmodium reticulatum* var. *pilosum* Craib is characterized by Craib as ‘the spreading long hairs on the stem and branches give the plant a very different appearance’. It was treated as a synonym of *D. heterocarpon* subsp. *angustifolium* Ohashi in Ginkgoana **1**: 213 (1973), but the form is distinct from the typical form.

D. heterocarpon (L.) DC. subsp. *angustifolium* Ohashi

f. **pilosum** (Craib) Ohashi, comb. et stat. nov.

D. reticulatum var. *pilosum* Craib, Fl. Siam. Enum. **1**: 416 (1928). Type: Siam. Doi Suteh, open grassy forest, ca. 1350 m. *A.F.G. Kerr 1308* (K, holo.).

5) **A white flowered form of *Desmodium heterocarpon***

Desmodium heterocarpon (L.) DC. subsp. *heterocarpon* var. *heterocarpon* f. **albiflorum** (Ridley) Ohashi, comb. et stat. nov.

D. polycarpum var. *albiflorum* Ridley, Fl. Malay Pen. **1**: 609 (1922).

6) **Taxonomic status of *Desmodium ovalifolium***

Desmodium ovalifolium had been separated from *D. heterocarpon* (or *D. polycarpum*) by Wallich (1831–32), Merrill (1910), Gagnepain (1920), Ridley (1922), and others, while Van Meeuwen (1961), Backer & Bakh. f. (1963), Ohashi (1973), etc. regarded both species as identical. A note by Ridley (1922), “This (= *D. ovalifolium*) has been confused by most botanists with *D.*

polycarpum, though in life the two could not be mistaken. It differs in its creeping habit, round silky leaves and pale lavender flowers", could not be confirmed on herbarium specimens except for the shape and hairiness of leaves. Characters in the leaves of *D. ovalifolium* are, unfortunately, continuous with those of *D. heterocarpon*.

Recently *Desmodium ovalifolium* was studied by Rugayah (1986, '87) and by Schultze-Kraft and Benavides (1988). Rugayah stated that some differences are present in morphological and anatomical characters between var. *heterocarpon* and var. *ovalifolium* in flowers, leaflets, epidermal cells and stomata. According to Schultze-Kraft and Benavides, who have observed this species and *D. heterocarpon* in more than 300 different populations not only in their natural habitat in SE Asia but also under experimental field conditions in Colombia, *D. ovalifolium* is a prostrate, strongly stoloniferous and mat-forming herb or subshrub with 1-foliolate leaves when young and 1- and 3-foliolate when mature, the leaflets somewhat coriaceous, lustrous and without any markings on the upper surfaces, with compact inflorescences, and with densely pubescent pods. These features shows clear differences from typical *D. heterocarpon* (Schultze-Kraft and Benavides, l. c.).

Desmodium heterocarpon is polymorphic, but the form referable to *D. ovalifolium*, in most cases, can be recognized by the combination of those morphological characters. The problem is the presence of forms intermediate between both, but, according to Schultze-Kraft & Benavides, natural hybrids between them are produced. I think, therefore, that *D. ovalifolium* is better recognized as a subspecies of *D. heterocarpon*.

There are three collections under Wallich no. 5730 in the Wallich Herbarium of Kew, of which one is mounted on one sheet, 5730a, and other two are on one sheet, 5730b. According to the Wallich's

Catalogue, the Wallich no. 5730 is described as "B Tavoy W.G.". However, two kinds of labels are attached on 5730b sheet (Fig. 4). No. 5730a (Fig. 3) was collected by Wallich in 1822 in Penang, Malaya. One of the two labels attached on the 5730b on the right hand is Tavoy (2 Oct. 1827, no. 350) and the other on the left hand is Kilaben (8 Oct. 1827, no. 388) (Fig. 4). Both collections of 5730b are made by W. Gomez in and near Tenasserim, Burma.

Desmodium heterocarpon subsp. ***ovalifolium*** (Prain) Ohashi, comb. nov.

D. polycarpum DC. var. *ovalifolium* Prain in Journ. Asiat. Soc. Beng. 66(2): 141 (1897).

D. ovalifolium Wallich [Cat. no. 5730 (1831–32), nom. nud.; Prain, l.c.] ex Merr. in Philip. Journ. Sci. Bot. 5: 85 (1910). Gagnep. in Fl. Gén. Indoch. 2: 587 (1920). The specific combination, *D. ovalifolium*, was validated by Merrill (1910).

D. heterocarpon subsp. *heterocarpon* var. *ovalifolium* (Wall. ex Prain) Rugayah in Reinwardtia 10: 382 (1987).

Distr.: Thailand, Cambodia, Laos, Vietnam, Malay Peninsula, Sumatra, Borneo, Celebes, Java, and the Philippines.

7) Key to the infraspecific taxa A key to the infraspecific taxa of *Desmodium heterocarpon* is prepared by revision of my previous key (Ohashi 1973) with addition of several new treatments mentioned in this paper.

1. Terminal leaflets narrowly ovate, acute or obtuse at apex, 3–6.5 times longer than broad. Inflorescences 10–30 cm long, not branched subsp. ***angustifolium***
2. Stems and branches with appressed hairs f. ***angustifolium***
2. Stems and branches with spreading long hairs f. ***pilosum***
1. Terminal leaflets otherwise, usually obtuse or



Fig. 4. The specimen, Wallich 5730a (K), one of the two on which the name *Desmodium ovalifolium* Wallich is based.

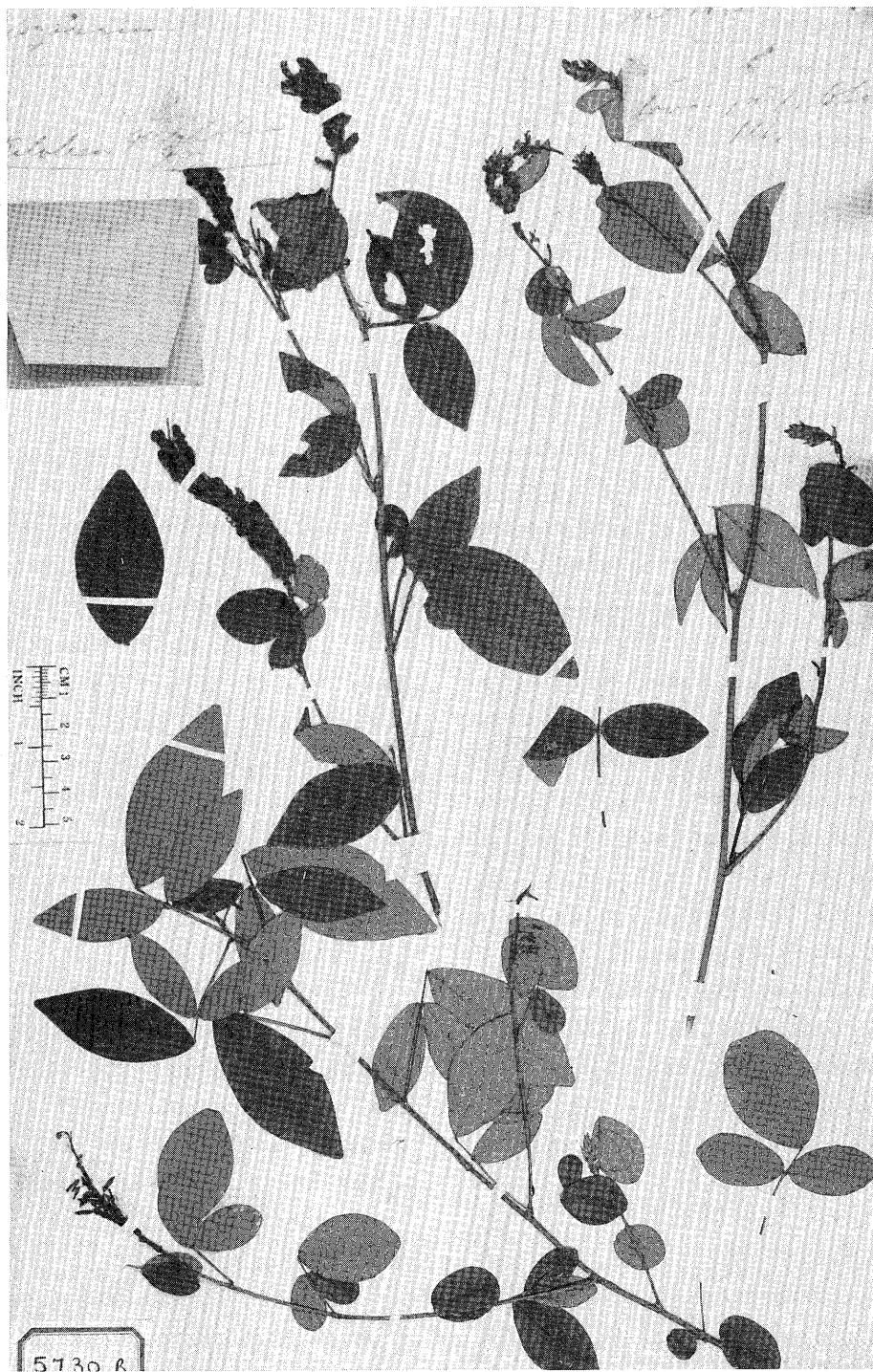


Fig. 5. The specimen, *Wallich 5730b* (K), labeled as Tavoy (right) and as Kilaben (left). These were collected by W. Gomez. One of the two on which the name *Desmodium ovalifolium* Wallich is based.

rounded at apex, less than 3 times longer than broad. Inflorescences 3–13 cm long, simple or branched 2

2. Inflorescence short, usually less than 5 cm long, very densely flowered. Pods with densely long yellowish or whitish hooked-hairs (0.5–1.5 mm long). Terminal leaflets ovate or elliptic to broadly ovate, acute or obtuse, glabrous or nearly glabrous above. Flowers more than 4 mm long with pedicels of 2–3 mm long. Prostrate, stoloniferous herbs or subshrubs subsp. **ovalifolium**
2. Inflorescence elongated. Pods sparsely to densely pubescent white hooked- and straight hairs (0.1–1.5 mm long). Terminal leaflets usually obovate, elliptic, or oblong sparsely to subdensely hairy above. Flowers 3–4 mm long with pedicels of 4–7 mm long. Erect or ascending or prostrate herbs or subshrubs 3 (subsp. **heterocarpon**)
3. Inflorescence-rachides densely covered with appressed straight hairs (up to 1.5 mm long), rarely mixed with a few spreading hooked hairs (0.2–0.5 mm long). Pedicels usually glabrous but occasionally puberulent var. **strigosum**
3. Inflorescence-rachides covered with spreading hooked hairs (0.2–0.7 mm long). Pedicels with spreading minute glandular hairs (less than 0.3 mm long) 4
4. Inflorescence lax-flowered. Pedicels 7–10 mm long in fruit var. **birmanicum**
4. Inflorescence not lax-flowered. Pedicels 4–8 mm long in fruit 5
5. Pods glabrous var. **gymnocarpum**
5. Pods with hooked hairs 6 (var. **heterocarpon**)
6. Flowers white f. **albiflorum**
6. Flowers pale to deep reddish purple,

mauve, pink, bluish violet
..... f. **heterocarpon**

References

- Bentham G. 1852. *Florula Hongkongensis*: an enumeration of the plants collected in the island of Hong-Kong, by Capt. J.G. Champion, 95th Reg., the determinations revised and the new species described by George Bentham, Esq. Hook. Kew Journ. **4**: 46–47.
- De Candolle A.P. 1825. *Desmodium*, in *Prodromus systematis naturalis regni vegetabilis* **2**: 325–339. Paris.
- Meeuwen M.S. van 1961. Notes on *Desmodium* Desv. In van Meeuwen M.S., van Steenis C.G.G.J. and Stemmerik J., Preliminary revisions of some genera of Malaysian Papilionaceae II. *Reinwardtia* **6**: 93–96.
- Merrill E.D. 1910. *Desmodium*. In An enumeration of Philippine Leguminosae, with keys to the genera and species. *Philip. Journ. Sci. (Bot.)* **5**: 78–88.
- Ohashi H. 1973. The Asiatic species of *Desmodium* and its allied genera (Leguminosae). 210–216 (*D. heterocarpon* (L.) DC.). Tokyo.
- 1990. *Desmodium schubertiae* (Leguminosae), a new species from Cambodia and Vietnam. *Journ. Arnold Arb.* **71**: 381–384.
- Ridley H.N. 1922. *Desmodium*. In The flora of Malay Peninsula **1**: 605–611. London.
- Rugajah 1987. A new status for *Desmodium ovalifolium* (Papilionaceae). *Reinwardtia* **10**: 381–382.
- Schindler A.K. 1928. Die Desmodiinen in der botanischen Literatur nach Linne. *Fedde, Rep. Beih.* **49**: 1–371.
- Schultze-Kraft R. and Benavides G. 1988. Germplasm collection and preliminary evaluation of *Desmodium ovalifolium* Wall. Genetic Resources Communication No. 12. CSIRO

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要 旨

マメ科ヌスビトハギ属の *Desmodium heterocarpon* (L.) DC. は西アジアを除くアジアの亜熱帯地方を中心に広く分布し、草地、林縁、裸地などにふつうに生育する植物である。わが国では静岡県以西から四国、九州、沖縄で日当たりの良い草地にみられる（シバハギと呼ばれている。シバハギはこの種に含まれる一形で、これは典型的な形として f. *heterocarpon* に当てられるが、日本ではこれを別種として九州から記載された *D.*

buergeri に当てる意見もある）。本種はヌスビトハギ属の中で最も形態的変異の幅の広い種の1つであり、いくつかの亜種や変種が区別されている。また、近縁種も多い。本種は植物学ばかりでなく農学や薬学でも研究対象とされており、近縁種との区別や種内分類群の同定について混乱がみられる。近縁種間の区別については最近別に発表したので (Ohashi 1990), ここでは *D. heterocarpon* の種内分類群を再分類し、学名上の問題とタイプを整理した。また、1973年に作った本種に含まれる種内分類群にたいする検索表が不備となったので改訂した。